

## *Chiropsella bart* n. sp., a new box jellyfish (Cnidaria: Cubozoa: Chiropodrida) from the Northern Territory, Australia

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### ABSTRACT

A new species of multi-tentacled box jellyfish from eastern Arnhem Land along the Gulf of Carpentaria, renowned locally for occurring only in the so-called 'safe season' (i.e., the dry season), is described. *Chiropsella bart* n. sp., differs from other chiropsalmids in maturing at a much smaller size, in its mature tentacle number, in having coalesced gastric saccules in the form of a kidney-bean-shaped knob, and in having very long pedalia with the branches and tentacles clustered near the distal end.

KEYWORDS: taxonomy, Cnidaria, Coelenterata, Chiropsalmidae, Chiropodridae, *Chiropsalmus*, stinger season, Gulf of Carpentaria.

### INTRODUCTION

Box jellyfishes in Australia have long been a concern, with at least 70 deaths attributed to *Chironex fleckeri* Southcott (Currie and Jacobs 2005). The Chiropodrida (i.e., the multi-tentacled box jellyfishes) of Australia have been grouped into only two species, *Chironex fleckeri* and *Chiropsalmus quadrigatus* Haeckel (Cicland and Southcott 1965; Barnes 1965, 1966; Keen 1971; Freeman and Turner 1972; Brown 1973; Fenner 1986; Sutherland 2001). Recent authors have separated the Australian species of *Chiropsalmus* from the true Burmese *Chiropsalmus quadrigatus*, but have still not commented on morphological diversity in the genus around Australia, implying that the regional forms are all the same species (Edmonds 1975; Williamson *et al.* 1996; Carrette *et al.* 2002; Gordon *et al.* 2004), similar to the assumptions made for *Chironex* (Williamson *et al.* 1996; Carrette *et al.* 2002; Currie *et al.* 2002). In fact, recent morphological and molecular analyses of Australian Chiropodrida (Gershwin 2005) have indicated considerable diversity in the group, with at least five species comprising what is currently known as *Chironex fleckeri* and at least two species recognised interchangeably as *Chiropsalmus* sp. or *Chiropsalmus quadrigatus*.

The common '*Chiropsalmus*' from northern Queensland was recently described as a new genus and species, *Chiropsella bronzie* (Gershwin 2006a). *Chiropsella* differs

from *Chiropsalmus* in having sessile, solid gastric saccules and lacking exumbrellar nematocysts.

A peculiar chiropsalmid from the Gove Peninsula in eastern Arnhem Land was reported by Currie *et al.* (2002). This medusa matures at a much smaller size than is typical for most species of Chiropodrida, and normally occurs only during the local dry season, in contrast to all other known species in the Chiropodrida, which are predominantly wet season or summertime species. This 'Gove chiropodrid', as it is commonly known, is similar to, but distinct from, the Queensland *Chiropsella bronzie*. The purpose of this paper is to describe this new species of chiropsalmid from Arnhem Land. This species is not known to be harmful to humans, aside from a localised painful sting.

### MATERIALS AND METHODS

All specimens except the holotype were caught during routine netting operations off the Gove Peninsula Surf Life Saving Club, and forwarded to the Museum and Art Gallery of the Northern Territory (NTM) for identification; the holotype was caught independently and donated by R. Hartwick. All measurements and character assessments were thus made on preserved material. Measurements were made with Max-Cal digital calipers to the nearest 0.01 mm. Bell height (BH) was measured from the apex of the bell to the velarial turnover. Diagonal bell width (DBW) was measured across diagonal pedalia on a flattened specimen,

at the height where the pedalum joins the exumbrella of the bell. Interrhopalial width (IRW) was measured between adjacent rhopalia, with the specimen flattened. Tentacle base width (TBW) was measured at the uppermost part of the tentacle, immediately below the pedalum; if the tentacle was flattened, width was measured across the widest points. Sex was determined, when possible, by biopsy. Female gonads have obvious ova; male gonads have a conspicuous 'finger-print' appearance of many fine more-or-less parallel lines. Nematocysts were examined and measured with a Leica DMLB compound microscope and Leica IM-50 Image Manager v. 1.20 for Windows; all observations and photographs were made through a 40x objective (i.e., 400x magnification). Nematocysts were identified following the keys of Calder (1974), Mariscal (1971), and Williamson *et al.* (1996), as elucidated in Gershwin (2006b).

## SYSTEMATIC RESULTS

### Class Cubozoa Werner, 1973

### Order Chiropodopida Werner, 1984

### Family Chiropsalmidae Thiel, 1936

(*sensu* Gershwin 2006a)

### Genus *Chiropsella* Gershwin, 2006

### *Chiropsella bart* n. sp.

(Figs 1–4)

*Chiropsalmus* sp. Currie, 1992: 1–2.

Gove chiropodopid Currie *et al.*, 2002: 649; Currie and Jacups 2005: 631–636.

*Chiropsalmus* n. sp. B Gershwin, 2005: 125–126, pl. 4.9C, and throughout; Gershwin 2006b: 12; pl. 28; cnidome.

*Chiropsella* n. sp. Gershwin, 2006a: 25, 36; Table 1; comparison with *C. bronzie*.

**Material examined.** HOLOTYPE – NTM C15252, Town Beach, Nhulunbuy, Gove Peninsula, NT, coll. P. Schelle and R. Hartwick, 17 May 1986; BH 47.89, DBW 62.03, IRW 30.34, TBW 1.42, 5-tentacle stage on all 4 pedalia, male.

**Other material.** PARATYPES – NTM C14603, Nhulunbuy, Gove Peninsula, N.T., coll. Surf Life Savers, 6 October 2002, BH 44.81, DBW 62.91, IRW 33.98, TBW 1.76, 5-tentacle stage on all 4 pedalia, mature male; NTM C14601, Nhulunbuy, Gove Peninsula, N.T., coll. Surf Life Savers, 27 April 2002, BH 51.05, DBW 76.08, IRW 37.28, TBW 1.37, 5-tentacle stage, sprouting the 6th on the one intact pedalum, gravid female; NTM C14602, same loc. data as NTM C14601, BH 43.92, DBW 68.54, IRW 34.77, TBW 1.44, 5-tentacle stage on all 4 pedalia, gravid female; NTM C14604, same loc. data as C14603, BH 33.05, DBW 46.40, IRW 24.11, TBW 1.00, 5-tentacle stage on all 4 pedalia, gravid female; NTM C14605, same loc. data as C14603, BH 16.39, DBW 27.03, IRW 12.16, TBW 0.73, 4-tentacle stage, sprouting a 5th on one

pedalum, immature; NTM C11046, Nhulunbuy Town Beach, Gove Peninsula, N.T., coll. Surf Life Savers, 2 June 1991, 3 specimens BH 45–50.

**Diagnosis.** *Chiropsella* species reaching about 5 cm BH with up to about 5 tentacles per pedalum; with long scalpel-like pedalia with main tentacles forming a more or less terminal cluster; with volcano-shaped diverticulum on pedalial canal near pedalial base; with coalesced solid, knob-like gastric saccules, appearing as single kidney-bean-shaped structure.

**Description.** Body small, with mature gonads at about 3 cm, reaching known maximum of about 5 cm BH, strongly cuboid (Fig. 1). Body mesogloea thick and relatively solid, with thickened and stiff apical dome and interradial pillars; with shallow sub-apical coronal furrow and well-defined interradial and adradial furrows. Adradial furrows extend laterally at level of stomach, forming a well-defined rectangular periradial region. Exumbrellar surface smooth, lacking nematocyst warts or freckles.

Pedalia (Fig. 2A) long, scalpel-shaped, with pronounced adaxial keel reminiscent of structure of carybdeids; abaxial tentacle issuing distally well past halfway point; remaining fingers and tentacles arranged close together more or less terminally, but opposite rather than alternate. Pedalial canal flattened in cross section, with volcano-shaped upward-pointing diverticulum near base. Sub-terminally, pedalial canal bifurcated, each leg giving rise to branches on its own side only (Fig. 2B). Pedalial canals straight at tentacle insertion.

Tentacles up to 5 per pedalum in present collection, with one specimen having a 6th nub; round and very fine in cross section; straight at base. Banding pattern could

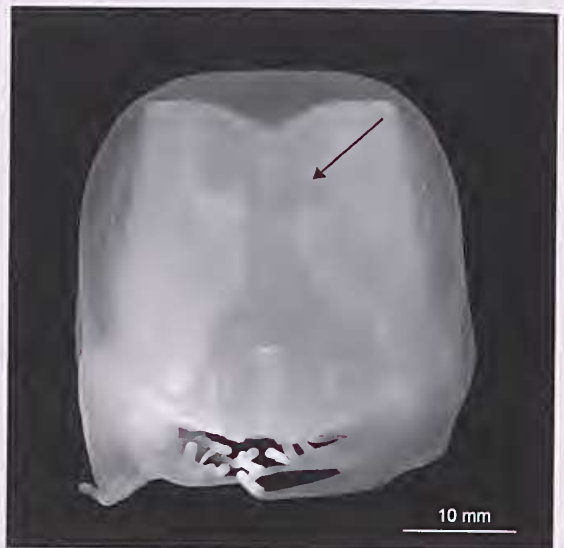


Fig. 1. *Chiropsalmus bart* n. sp. holotype; note coalesced gastric saccules (arrow).

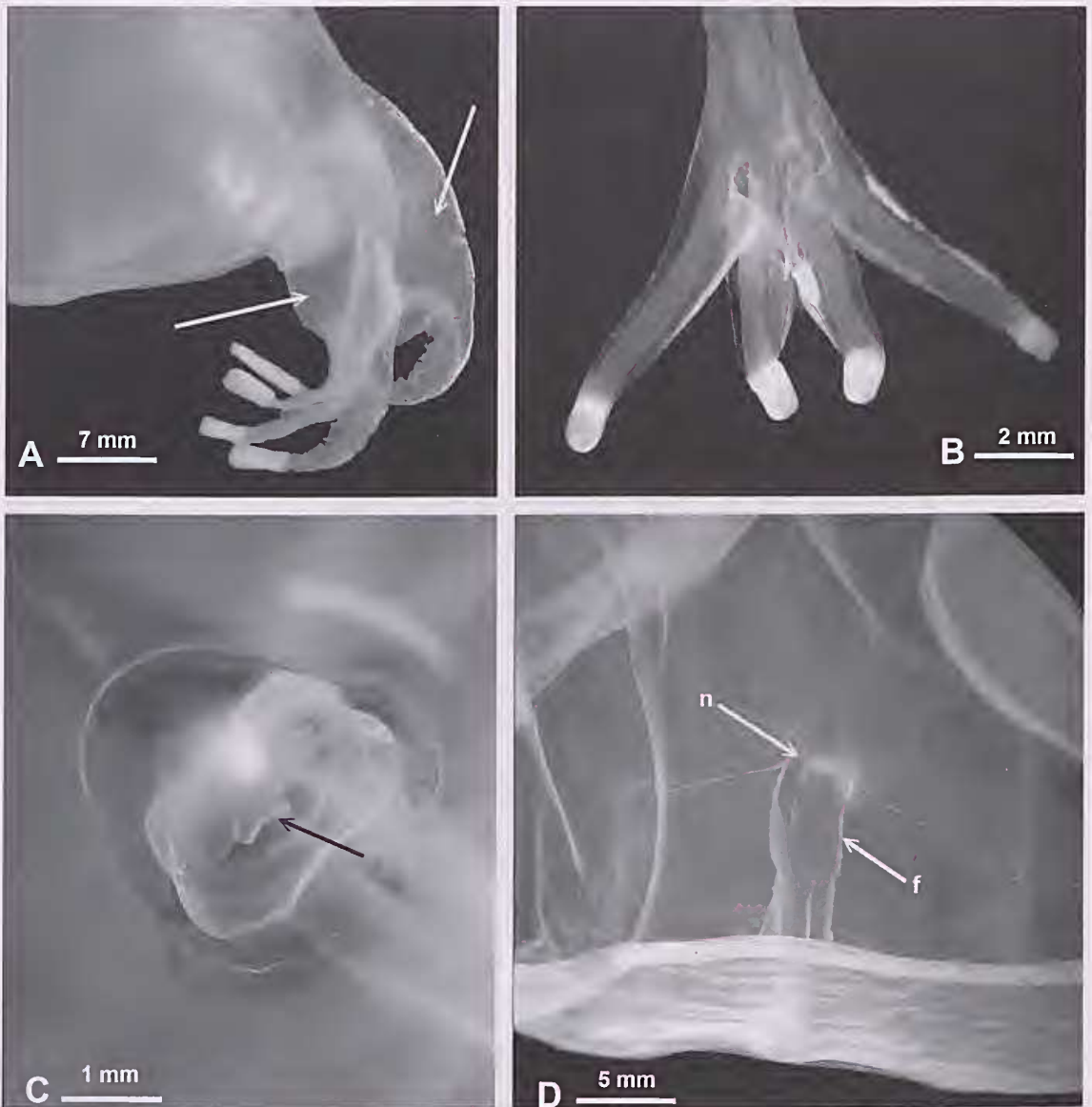


Fig. 2. *Chiropsalmus bart* n. sp. A, pedalium, side view; note abaxial and adaxial keels (arrows); B, pedalium, adaxial view; C, rhopaliar niche ostium, exumbrellar view; note flap (arrow); D, rhopaliar niche (n), subumbrellar view, and thickened gelatinous frenulum (f).

not be definitively determined due to loss of tentacles on all specimens.

Rhopaliar niche substantially raised from exumbrellar surface. Ostium dome-shaped, with well-developed upper covering seale and no lower seale; upper seale with horizontal, eigar-shaped or banana-shaped flap hanging down in middle to shield rhopalium (Fig. 2C). Niche with single low rounded extension in each of the two upper corners, giving niche a tall, reetangular appearance. Rhopalium with 6 eyes, 2 median ones with lenses; and 2 pairs of lateral eye spots. Statolith located below main eye, rather than behind it; statolith shape could not be determined due to loss in preserved material. Rhopaliar

window flat on subumbrellar wall, overgrown by top of frenulum (Fig. 2D).

Velarial canals originating from two main canal roots in each oetant, but branching so profusely as to be impossible to count. Perradial lappets not substantially raised, but very broad, with many canals emanating from lateral and distal edges (Fig. 3A). Frenulum a solid, gelatinous structure, extending about  $3/4$  distance toward velarial margin (Fig. 2D).

Gastric saccules forming a coalesced, kidney-bean-shaped structure (Fig. 3B), solid and knob-like, projecting into subumbrellar cavity but not pendant. Gonads leaf-like, attached along entire bell height of interradii, wider

Table 1. Comparison of characters of species in the family Chiropsalmidae.

	Gastrie saecules	Pedial branching	Pedial canal	Tentacle no; cross section	Bell texture	Distribution
<i>Chiropsalmus quadrumanus</i> (Müller)	Simple, solid, half as long as the bell	In both directions; all along pedulum	Undivided, branching in both directions; without thorn	Up to 7–9; round and fine	With nematoeyst warts	Type from southern Brazil; reported to South Carolina, USA
<i>Chiropsalmus zygouema</i> Haeckel	Oval, very small	Two asymmetrical tentacles	(Unknown)	2; unknown shape	(Unknown)	Argentina; found only once
<i>Chiropsalmus alipes</i> Gershwin	Simple, small, with one edge wavy	In both directions; terminal	Divided; with 90° corner at bend	Up to 3–4; round and thick	With nematoeyst warts	W. coast of southern Mexico
<i>Chiropsella brouzie</i> Gershwin	Simple, solid, sessile, separate	In both directions; all along pedulum	Divided, each branching in only 1 direction; with 'knee'-like bend	Up to 9; round and fine	Smooth, lacking nematoeysts	N. QLD from Cooktown to Townsville
<i>Chiropsella bart</i> n. sp.	Simple, solid, sessile, coalesce	In both directions; nearly terminal	Divided, each branching in only 1 direction; with 'volcano' at bend	Up to 5–6; round and fine	Smooth, lacking nematoeysts	Gove Peninsula, Arnhem Land, NT
<i>Chiropsoides buitendijki</i> (Horst)	Simple, hollow, as long as the bell, separate	In one direction only; all along pedulum	Undivided, branching in only 1 direction; with 'thorn' at bend	Up to 5–6; flat and ribbon-like	Smooth, lacking nematoeysts	Type from Java Sea; reported from Sri Lanka and southern India
<i>Chiropsoides quadrigatus</i> (Haeckel)	Too young for determination	In one direction only; all along pedulum	Undivided, branching in only 1 direction; with 'thorn' at bend	4; flat and ribbon-like	Smooth, lacking nematoeysts	Type from Rangoon; all other records doubtful

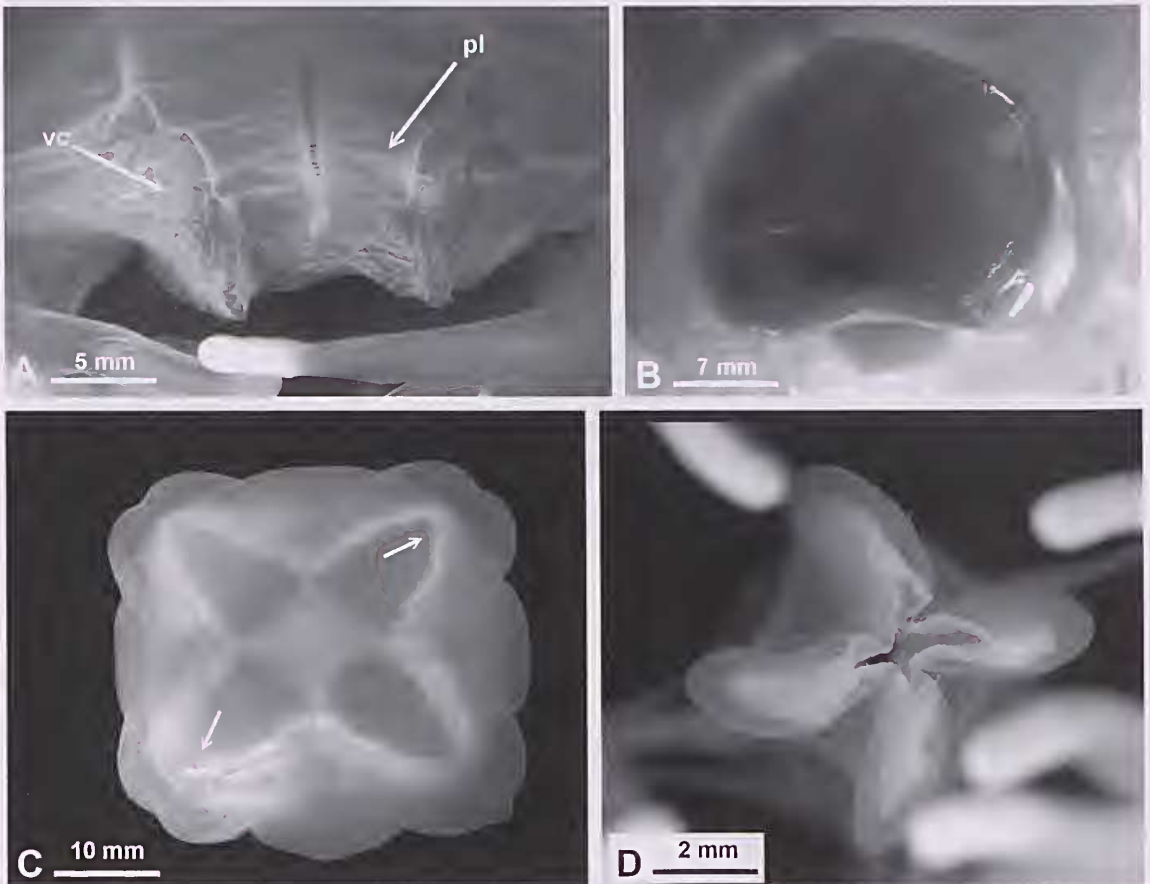


Fig. 3. *Chiropsalmus bart* n. sp. A, perradial lappets (pl) and velarial canals (ve) from one quadrant of velarium, exumbrellar view; B, gastric saecules, one coalseed pair; C, gastric phaeellae (arrows), apical view; D, mouth, subumbrellar view.



Fig. 4. *Chiropsalmus bart* n. sp. enidome. Cigar-shaped microbasal *p*-mastigophores (1); large football-shaped microbasal *p*-mastigophores (2); small oval 'beehive' isorhizas (3); small rod-shaped isorhizas (4).

in middle than at top or bottom (Fig. 1). Interradial septa not observed. Stomach shallow and flat, with very short mesenteries reaching only about as far as edge of phacellac. Phacellac continuous, shaped like 4-pointed star (Fig. 3C). Mouth cruceiform, with short, smooth lips (Fig. 3D), hanging to about 1/3 bell height.

**Cnidome** (Fig. 4). Four types of nematocysts found in squash preparation from tentacle of holotype: 1) Cigar-shaped microbasal *p*-mastigophores, 39.28–44.84  $\mu\text{m} \times 8.79$ –10.92  $\mu\text{m}$ ,  $n=12$ ; 2) Large football-shaped *p*-rhopaloids, 21.27–26.29  $\mu\text{m} \times 12.73$ –14.37  $\mu\text{m}$ ,  $n=10$ ; 3) Small oval 'beehive' isorhizas, 9.04–9.94  $\mu\text{m} \times 6.88$ –7.71  $\mu\text{m}$ ,  $n=5$ ; 4) Small rod-shaped isorhizas, 13.21–14.20  $\mu\text{m} \times 6.54$ –7.27  $\mu\text{m}$ ,  $n=3$ .

**Etymology.** Named to honour Prof. Bart Currie, of the Menzies School of Health Research, Darwin, Northern Territory. Bart's meticulous studies and observations have led to many important contributions in the medical aspects

of cubozoology, and he kindly brought this species to our attention. Noun in apposition.

**Systematic remarks.** *Chiropsella bart* is characterised by a curious morphology. Like *Chiropsella bronzie* Gershwin, from North Queensland—previously erroneously called *C. quadrigatus*, e.g., Barnes (1965, 1966); Cleland and Southcott (1965); Keen (1971); Freeman and Turner (1972); Brown (1973); Fenner (1986)—the gastric sacculles are sessile, solid gelatinous knobs. However, in *C. bart* the sacculles are coalesced, whereas in *C. bronzie* they are divided. No other chiropod possess sessile, solid sacculles such as these. The tentacles are also round in cross section and very fine in both species, although the pedalia are quite different, being long and scalpel-shaped in *C. bart* but more claw-like in *C. bronzie*. Finally, in fully mature *C. bart*, the tentacles are typically five per pedalum, with one specimen sprouting a sixth on one pedalum; in contrast, fully mature *C. bronzie* have up to about nine tentacles.

## DISCUSSION

*Chiropsella bart* is a most remarkable medusa, being primarily present during the Northern Territory dry season (Currie *et al.* 2002), contrasting with all other known tropical species of cubozoans which reach their peak abundances during their local wet season. Very little is currently known about this species, except that it is common in the early dry season on the sandy beaches of Nhulunbuy, where it sometimes swarms in the hundreds or thousands (unpublished GPSLSC netting records).

The sting of *Chiropsella bart* produces only mild pain and itching, usually persisting less than two hours (Currie *et al.* 2002). It is perhaps the mildest sting known in the Chirodromida.

*Chiropsella bart* is one of the numerous new species of Australian Chirodromida, a group where the species richness has not been previously appreciated. Others include a small chiropsalmid from northern New South Wales, which is the first known member of the Chirodromida from temperate waters; new species of *Chironex* from each of the Gulf of Carpentaria, the Darwin region, and the Broome region; and a very unusual new species with black tentacles, found in the far northern Kimberley region. In addition to the recently described *Chiropsella bronzie* from North Queensland (Gershwin 2006a), the most peculiar *Chirodromes maculatus* with a spotted exumbrella, subumbrellar muscle bands, filamentous gonads, and no gastric saccules, was recently described by Cornelius *et al.* (2005). For most of these species, their formal description will be only the tip of the iceberg, so to speak, with the remaining features of their biology, ecology, and toxinology yet to be elucidated.

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